

REMARKS

Claims 11-15 are in the present application.

Claim 11 has been amended as indicated to recite a crystal growth apparatus which includes an outer electrode of "graphite". Support for this amendment is found on page 7, line 5, of the specification as well as in Figure 2 of the present drawings and no new matter has been added.

The Office Action rejection of claims 11-13 & 15 as obvious under 35 USC 103(a) over Park et al (USP '944) in view of Kurosawa et al (JP '573 A) is respectfully traversed.

That is, the Office Action point of view has been that Park et al. apply a vertical gradient freeze crystal growth apparatus having a means for applying a magnetic field, including a vessel 61, for holding a seed crystal (Figure 1, col. 6, lines 1-20). Park is also said to disclose a thin gold film 33 coated on the inner surface of a tube 31 per Park's Figure 2 and The Office Action concludes that the gold film clearly suggests applicants' outer electrode (such as graphite crucible 17 of applicants' Figure 2).

The Office Action further finds other elements of applicants' claim 11, such as Park's heating coil and his electromagnet to apply a magnetic field. The Office Action goes on to note that Park does not teach a small inner elongated electrode (such as electrode 16, shown in applicants' Figure 2 and mentioned in applicant's claim 11 at ¶ c).

To supply the missing inner electrode, the Examiner turns to the Kurosawa et al. patent, which shows an electrode 2 immersed in a melt 3 within a platinum crucible 1. The Examiner then finds that it would have been obvious for person skilled in the art at the time of the invention, to modify Park et al. by using an immersed electrode, presumably in a melt within a crucible and applying voltage to such inner electrode.

The Examiner then goes on in an attempt to dismiss the limitations in applicants' claim 11 of applying voltage to a coil to impose magnetic field lines (11h)

across radial electric current in the melt (11f), to impart a stirring force thereto, as just an intended use of the apparatus, which does not impart patentability to an apparatus claim.

However, what applicants' apparatus makes possible is stirring the melt by what is known as the Lorenz force, which occurs when an axial magnetic field is applied to radial electric current. More than intended use, that is an achievement of applicants' apparatus, per claim 11, which by its structure, makes possible stirring of the melt by other than mechanical means; which effect is not possible by the prior art combination apparatus proposed by the above Office Action.

However, the Office Action states at the bottom of its page 3, if the prior art structure is capable of performing the intended use, then it meets the claim (11).

The question is, is such composite prior art structure so capable?

Again, in *Response to Arguments*, at page 5 of the Office Action, the Examiner asserts the merits of the above prior art combination, i.e., Kurasawa teaches crucible and electrode, which are electrically connected and thus can be combined with the Park reference to provide an inner electrode and an outer electrode located within the magnet 50, such as shown in Park's Figure 2. Then the Office Action states for the second time if the prior art structure is capable of performing the intended use that it meets the claim.

But again, is such composite prior art structure so capable? The problem with such prior art structure is that the Kurosawa crucible 1 is of metal, i.e. platinum and the gold foil structure 33, shown in Figure 2 of Park is also of metal and a metal crucible or outer electrode can block the flow of a magnetic field generated by an encircling electromagnet such as magnet 50 in Figure 2 of the Park reference.

The above problem does not occur with applicants' stirring apparatus per claim 11, shown, e.g., in applicants' Figure 2, because such claim, as amended, defines a graphite outer electrode, which permits flow-through of the magnetic field so that it can react with the radial current flowing from the inner electrode, e.g., inner electrode 16 to outer electrode or crucible 17 of Figure 2, to achieve non-

intrusive stirring of the melt and thus more uniform crystal formation with reduced defect density.

That is, applicants' apparatus per claim 11, as amended, is capable of achieving electromagnetic stirring of the melt while the proposed prior art combination structure is not so capable. Accordingly, the above rejection of applicants' structure per claim 11 as obvious over Kurosawa and Park in combination, is believed met and such claim is believed novel over the applied references.

Also the above rejection of applicants' claims 11-13 & 15 as obvious over Park et al. in view of Kurosawa et al. is respectfully traversed. These claims are believed novel over the applied references in view of their dependence from claim 11, as amended, which is believed novel thereover as discussed above.

The Office Action rejection of claim 14 as obvious under 35 U.S.C. 103 (a) and unpatentable over the above Park and Kurosawa references and further in view of the reference to Niikura et al. (' 321) is respectfully traversed. Claim 14 is likewise believed novel over the above three references by virtue of its dependence from claim 11, as amended, which is believed novel thereover, as discussed above.

In sum, it is believed that the proposed hybrid structure of the prior art is not capable of performing electromagnetic stirring in contrast to the apparatus defined by applicants' claims 11 et seq.

Moreover, it is emphasized that applicants' above claims, including 11, as amended, recite in ¶ (h) "*means for applying voltage to said coil to impose magnetic field lines in said melt such that the flow of said radial electrical current crosses said magnetic field lines to impart a stirring force to said melt ...*", which means is not suggested nor possible by a combination of the above two cited references. And as this means does the same work as would mechanical stirring means, it is the equivalent of a structural component and not a mere intended use.

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In view of the foregoing, the claims of record, as amended, are believed distinguished over the applied art and in condition for allowance.

Respectfully submitted,



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